

I claim:

1. A system for locating at least one target device that supports a required service in an ad-hoc communications network connecting at least one device and supporting at least one service, wherein each said at least one target device is one of said at least one device and the required service is one

5 of said at least one service, comprising:

a memory device; and

a processor disposed in communication with the memory device, the processor configured to:

conduct an inquiry of the ad-hoc communications network to discover at least one

10 nearby device in said at least one device, the inquiry including an indication

that said at least one nearby device may include a middleware layer;

when the inquiry includes the indication that said at least one nearby device may

include the middleware layer:

create a connection to a peer device of said at least one nearby device;

15 confirm whether the peer device includes the middleware layer;

when the peer device includes the middleware layer:

send a service discovery request to the peer device; and

receive a response to the service discovery request, the response

including distributed information,

20 wherein the distributed information includes at least one reference to

the required service and an association between each

reference and one of said at least one target device.

2. The system of claim 1, wherein a density of said at least one nearby device over a coverage area for the ad-hoc communications network is high.

3. The system of claim 1, wherein the distributed information includes at least one information record, each information record including at least one of device information or application information.

4. The system of claim 3, wherein the device information includes state information, an address, a friendly name, a hop count, a sequence number, a time value, and a time counter.

5. The system of claim 3, wherein the application information includes an application identifier, capability information, version information, state information, an address, a hop count, a sequence number, a time value, and a time counter.

6. The system of claim 3, wherein when the peer device includes the middleware layer, the processor is further configured to:

store the disclosed information in a portion of the memory device,
wherein the portion includes at least one record.

7. The system of claim 6, wherein when the portion of the memory device is full, to store the disclosed information, the processor is further configured to:

identify an oldest record of said at least one record; and
overwrite the oldest record with a new information record from said at least one information
record.

5 8. The system of claim 6, wherein when the portion of the memory device is full, to store the
disclosed information, the processor is further configured to:

identify an old record of said at least one record;
identify a new information record from said at least one information record, the new
information record being a replacement for the old record; and
10 overwrite the old record with the new information record.

9. The system of claim 1, wherein a portion of the memory device includes exchanged
information that identifies at least one application or service that said at least one nearby device
supports.

15 10. The system of claim 9, wherein when receiving an inquiry request from one of said at least
one nearby device, the processor is further configured to:
distribute the exchanged information as part of a service discovery response.

20 11. The system of claim 1, wherein when the peer device includes the middleware layer, the
processor is further configured to:
establish a link connection to one of said at least one target device; and

access the requested service.

12. A method for locating at least one target device that supports a required service in an ad-hoc communications network connecting at least one device and supporting at least one service, wherein
5 each said at least one target device is one of said at least one device and the required service is one of said at least one service, comprising:

conducting an inquiry of the ad-hoc communications network to discover at least one nearby
device in said at least one device, the inquiry including an indication that said at least
one nearby device may include a middleware layer;

10 when the inquiry includes the indication that said at least one nearby device may include the
middleware layer:

creating a connection to a peer device of said at least one nearby device;

confirming whether the peer device includes the middleware layer;

when the peer device includes the middleware layer:

15 sending a service discovery request to the peer device; and

receiving a response to the service discovery request, the response including
distributed information,

wherein the distributed information includes at least one reference to the

required service and an association between each reference and one

20 of said at least one target device.

13. The method of claim 12, wherein a density of said at least one nearby device over a

coverage area for the ad-hoc communications network is high.

14. The method of claim 12, wherein the distributed information includes at least one information record, each information record including at least one of device information or application information.

15. The method of claim 14, wherein the device information includes state information, an address, a friendly name, a hop count, a sequence number, a time value, and a time counter.

16. The method of claim 14, wherein the application information includes an application identifier, capability information, version information, state information, an address, a hop count, a sequence number, a time value, and a time counter.

17. The method of claim 14, wherein when the peer device includes the middleware layer, the method further comprises:
storing the disclosed information in a portion of the memory device,
wherein the portion includes at least one record.

18. The method of claim 17, wherein when the portion of the memory device is full, the storing of the disclosed information further comprises:
identifying an oldest record of said at least one record; and
overwriting the oldest record with a new information record from said at least one

information record.

19. The method of claim 17, wherein when the portion of the memory device is full, the storing of the disclosed information further comprises:

- 5 identifying an old record of said at least one record;
identifying a new information record from said at least one information record, the new information record being a replacement for the old record; and
overwriting the old record with the new information record.

10 20. The method of claim 12, wherein a portion of the memory device includes exchanged information that identifies at least one application or service that said at least one nearby device supports.

21. The method of claim 20, wherein when receiving an inquiry request from one of said at least
15 one nearby device, the method further comprises:
distributing the exchanged information as part of a service discovery response.

22. The method of claim 12, wherein when the peer device includes the middleware layer, the method further comprises:
20 establishing a link connection to one of said at least one target device; and
accessing the requested service.

23. A computer program product for locating at least one target device that supports a required service in an ad-hoc communications network connecting at least one device and supporting at least one service, wherein each said at least one target device is one of said at least one device and the required service is one of said at least one service, comprising:

5 a computer readable medium storing:

program code for conducting an inquiry of the ad-hoc communications network to discover at least one nearby device in said at least one device, the inquiry including an indication that said at least one nearby device may include a middleware layer;

10 program code for creating a connection to a peer device of said at least one nearby device;

program code for confirming whether the peer device includes the middleware layer;

program code for sending a service discovery request to the peer device; and

program code for receiving a response to the service discovery request, the response

15 including distributed information,

wherein the distributed information includes at least one reference to the required

service and an association between each reference and one of said at least

one target device.

20 24. The computer program product of claim 23, wherein the distributed information includes at least one information record, each information record including at least one of device information or application information.

25. The computer program product of claim 24, the computer readable medium further storing:
program code for storing the disclosed information in a portion of the memory device,
wherein the portion includes at least one record.

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26. The computer program product of claim 25, wherein the program code for storing the
disclosed information further comprises:

program code for identifying an oldest record of said at least one record; and

program code for overwriting the oldest record with a new information record from said at

10 least one information record.

27. The computer program product of claim 25, wherein the program code for storing the
disclosed information further comprises:

program code for identifying an old record of said at least one record;

15 program code for identifying a new information record from said at least one information
record, the new information record being a replacement for the old record; and

program code for overwriting the old record with the new information record.

28. The computer program product of claim 23, wherein a portion of the memory device
20 includes exchanged information that identifies at least one application or service that said at least
one nearby device supports.

29. The computer program product of claim 28, wherein when receiving an inquiry request from one of said at least one nearby device, the computer readable medium further stores:

program code for distributing the exchanged information as part of a service discovery response.

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30. The computer program product of claim 23, the computer readable medium further storing:
program code for establishing a link connection to one of said at least one target device; and
program code for accessing the requested service.

10 31. A system for locating a target device that supports a required service in an ad-hoc communications network connecting at least one device and supporting at least one service, wherein the target device is one of said at least one device and the required service is one of said at least one service, comprising:

a memory device; and

15 a processor disposed in communication with the memory device, the processor configured to:

maintain a distributed database to associate each said at least one service to at least one of said at least one device;

conduct an inquiry of the ad-hoc communications network to discover at least one

20 nearby device in said at least one device, the inquiry including an indication that said at least one nearby device may include a middleware layer; and

access the distributed database to determine whether said at least one nearby device

includes the required service.

32. The system of claim 31, wherein the processor is further configured to:

establish a link connection with said at least one nearby device if the distributed database

5 includes an association between said at least one nearby device and the required service.

33. The system of claim 32, wherein the distributed database includes at least one reference to

the required service and an association between said at least one reference and one of said at least

10 one target device.

34. The system of claim 31, wherein the processor is further configured to:

decline a link connection with said at least one nearby device if the distributed database

indicates that said at least one nearby device does not include the required service.

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35. A method for locating a target device that supports a required service in an ad-hoc

communications network connecting at least one device and supporting at least one service, wherein

the target device is one of said at least one device and the required service is one of said at least one service, comprising:

20 maintaining a distributed database to associate each said at least one service to at least one of said at least one device;

conducting an inquiry of the ad-hoc communications network to discover at least one nearby

device in said at least one device, the inquiry including an indication that said at least one nearby device may include a middleware layer; and
accessing the distributed database to determine whether said at least one nearby device includes the required service.

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36. The method of claim 35, further comprising:
establishing a link connection with said at least one nearby device if the distributed database includes an association between said at least one nearby device and the required service.

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37. The method of claim 36, wherein the distributed database includes at least one reference to the required service and an association between said at least one reference and one of said at least one target device.

15 38. The method of claim 35, further comprising:
declining a link connection with said at least one nearby device if the distributed database indicates that said at least one nearby device does not include the required service.

39. A computer program product for locating a target device that supports a required service in
20 an ad-hoc communications network connecting at least one device and supporting at least one service, wherein the target device is one of said at least one device and the required service is one of said at least one service, comprising:

a computer readable medium storing:

program code for maintaining a distributed database to associate each said at least

one service to at least one of said at least one device;

program code for conducting an inquiry of the ad-hoc communications network to

discover at least one nearby device in said at least one device, the inquiry

including an indication that said at least one nearby device may include a

middleware layer; and

program code for accessing the distributed database to determine whether said at

least one nearby device includes the required service.

40. The computer program product of claim 39, the computer readable medium further storing:

program code for establishing a link connection with said at least one nearby device if the

distributed database includes an association between said at least one nearby device

and the required service.

41. The computer program product of claim 39, the computer readable medium further storing:

program code for declining a link connection with said at least one nearby device if the

distributed database indicates that said at least one nearby device does not include

the required service.

42. A system for locating a target device that supports a required service in an ad-hoc

communications network connecting at least one device and supporting at least one service, wherein

the target device is one of said at least one device and the required service is one of said at least one service, comprising:

means for maintaining a distributed database to associate each said at least one service to at least one of said at least one device;

5 means for conducting an inquiry of the ad-hoc communications network to discover at least one nearby device in said at least one device, the inquiry including an indication that said at least one nearby device may include a middleware layer; and

means for accessing the distributed database to determine whether said at least one nearby device includes the required service.

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43. The system of claim 42, further comprising:

means for establishing a link connection with said at least one nearby device if the distributed database includes an association between said at least one nearby device and the required service.

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44. The system of claim 42, further comprising:

means for declining a link connection with said at least one nearby device if the distributed database indicates that said at least one nearby device does not include the required service.